

MultiDSL



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MultiDSL

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MultiDSL

Introduction

- **DSL — Digital Subscriber Line**
- **Several DSL technologies**
 - IDSL (ISDN DSL)
 - HDSL (High Bit Rate DSL)
 - SDSL (Single Pair HDSL)
 - RADSL-CAP (Rate Adaptive ADSL-CAP)
 - RADSL-DMT (Rate Adaptive ADSL-DMT)
 - VDSL (Very High Bit Rate DSL)



MultiDSL Market Overview

xDSL Market Segmentation

- **WAN Copper**
 - RBOCs/Carriers own the local loop
 - Independent Telephone Companies own the local loop
- **DRY Copper**
 - CLEC/CAP/ISP leasing copper pair from telephone companies
- **Free Copper**
 - Copper wires within a building/campus
 - Typically owned by property management/building owners
 - ISPs can quickly offer xDSL service



MultiDSL Market Overview

- **Market Forces Driving DSL**
 - High-speed Internet applications
 - Increased opportunity due to Telecommunications Act of 1996
 - Competitive pressure from Cable companies
 - Need to alleviate voice network congestion
 - Ability to leverage existing “local loop” twisted pair of wire
- **Target Customers for MultiDSL**
 - RBOCs
 - CLECs/CAPs
 - Independent Telephone Companies
 - Frame Relay Service Providers
 - Internet Service Providers
 - Corporations and Universities



MultiDSL Market Overview

Application	28.8 Kbps	128 Kbps	768 Kbps	1.5 Mbps	3 - 6 Mbps
Internet - Consumer Access					
Internet - Small Office/Home Office					
Internet - Business Web Server Hosting					
Intranet - Mobile Worker					
Intranet - TeleWorker					
Intranet - Programmers					
MultiMedia - Graphics Designers					
MultiMedia - Interactive Web Sites					
MultiMedia - Video on Demand					



MultiDSL Market Overview

The case for IDSL per Dataquest

	1997	1998	1999	2000	2001
xDSL *	31,500	67,400	125,60	247,050	448,050
IDSL	43,60	212,000	444,100	734,100	1,103,500
Total	75,100	279,400	569,700	981,200	1,551,600

* Includes only ADSL, VDSL and SDSL.

Source: Dataquest (published in Communications Week, July 7, 1997, Page 27)

Reasons for IDSL:

Uses same ISDN CPE, avoids the “standards holy war”



MultiDSL Market Overview

CAP/CLEC : Buildings on Net

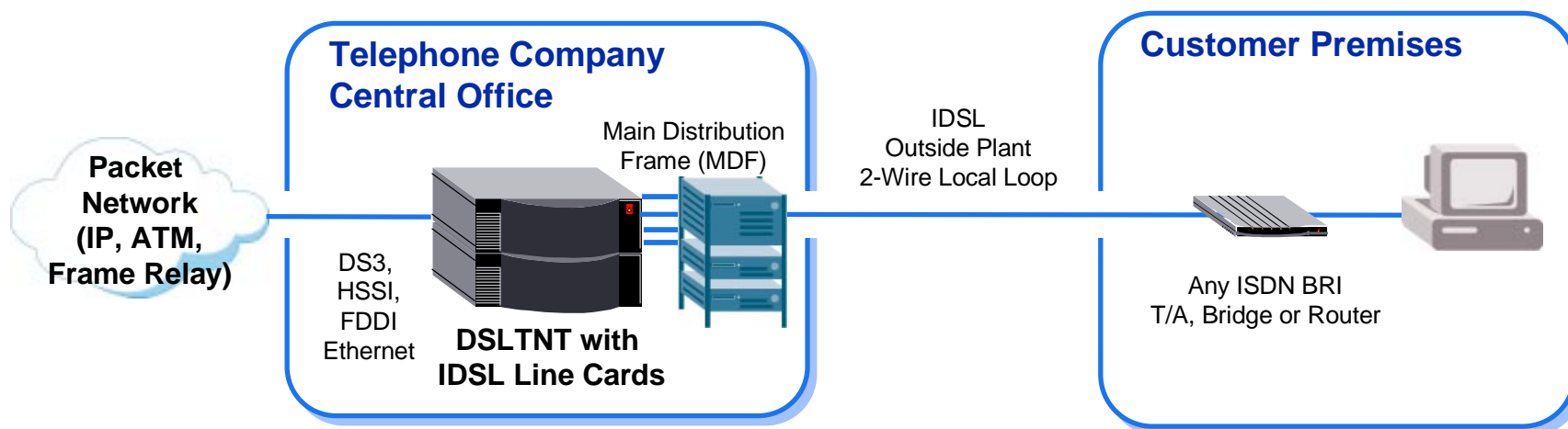
- **Total number of buildings on net: 23,875**
- **Top CAP/CLECs with access to buildings**
 - MFS: 11,031
 - MCIMetro: 3,200
 - TCG: 2,781
 - Hyperion Telecom: 1,101
 - GST Telecom 739
 - Brooks Fiber: 734
 - American Communications: 532
 - ICG Communications: 478
 - McLeod: 442
 - Intermedia Communications: 429
 - NEXTLINK Communications: 420

Source: New Paradigm Resources Group, Inc.



Technology Overview

ISDN Digital Subscriber Line (IDSL)

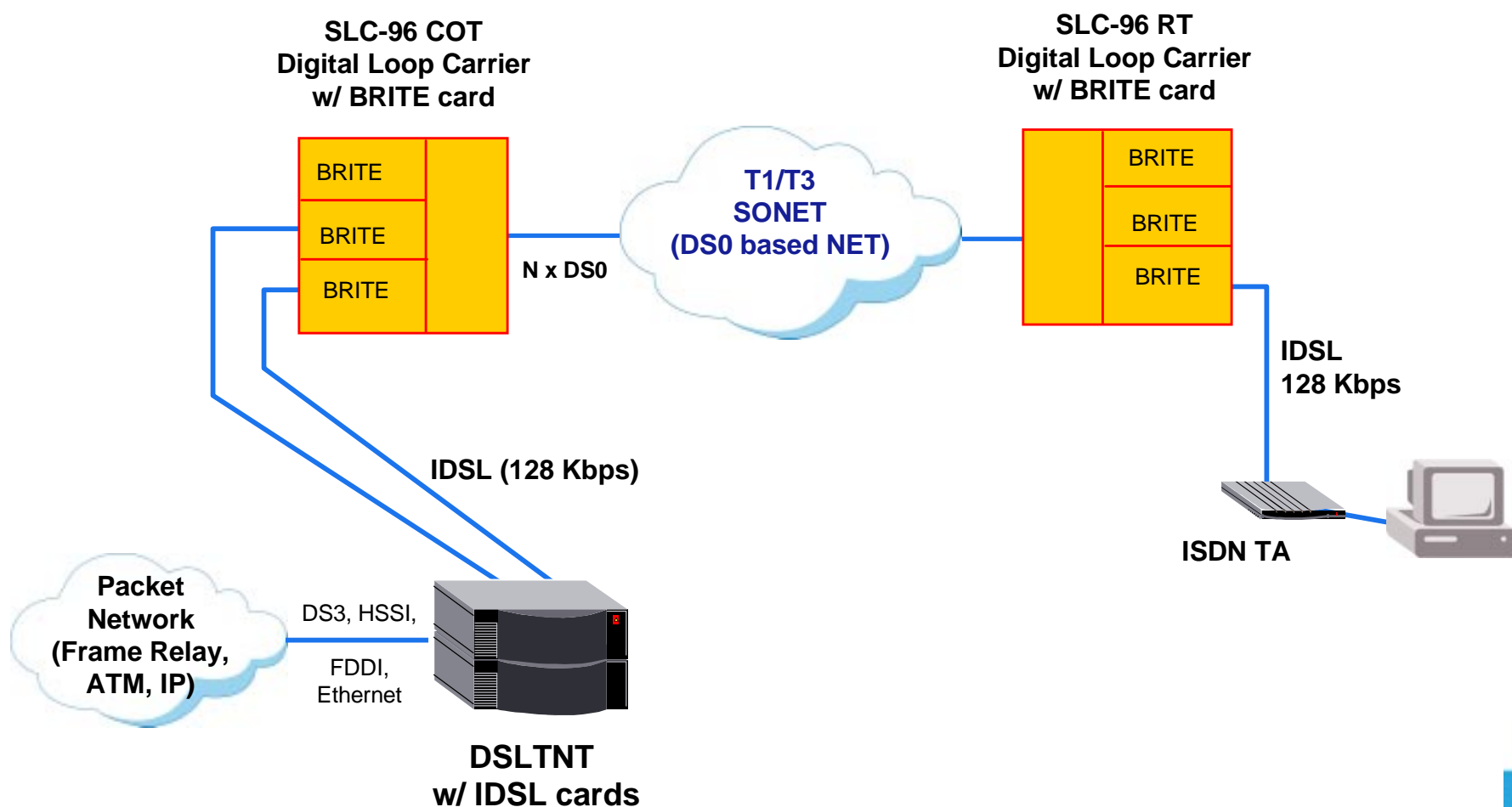


- IDSL – Technological innovation from Ascend
- 128 Kbps symmetric data rate
- Single pair local loop to 18,000 ft.
- Line monitoring and diagnostics
- Compatible with any ISDN BRI TA, bridge or router
- 2B1Q line code for transparent operation through “U” loop repeaters and Digital Loop Carrier Systems (DLCs)



Technology Overview

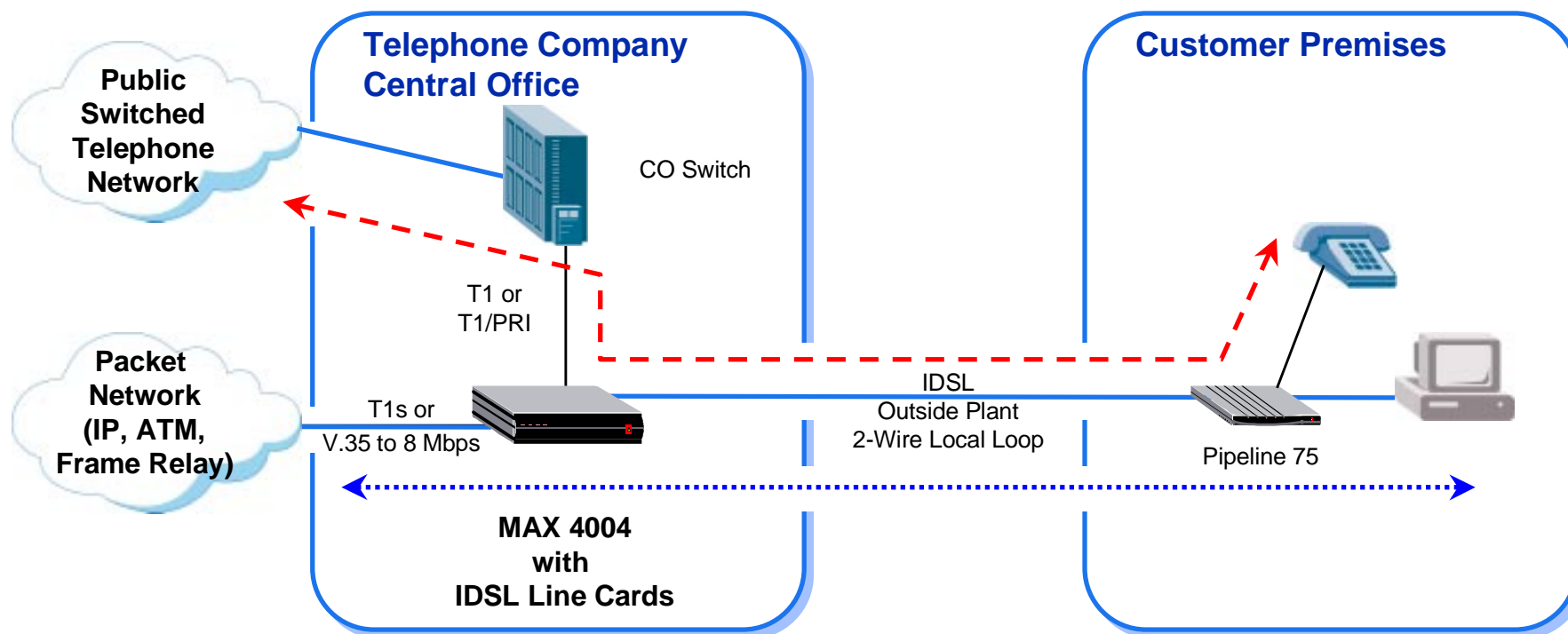
IDSL Transparent to SLC/DLC





Technology Overview

ISDN Digital Subscriber Line (IDSL) Voice & Data





Technology Overview

Why IDSL?

- **Very large percentage (approx. 30-40%) of local loops have DLCs/U Loop Repeaters**
 - Only IDSL will work
 - SDSL, HDSL, ADSL will not work
- **Protects investment on current ISDN CPE**
 - IDSL works with any ISDN TA from any vendor
 - SDSL, HDSL, ADSL require investment in new CPE
- **Ideal for longer distances than 18,000 feet**
 - With DLCs, IDSL can go tens of miles
 - SDSL/HDSL (up to 12,000 ft), ADSL (18,000 ft at lower speeds)
- **Can co-exist with T1 on the same binder group**



Technology Overview

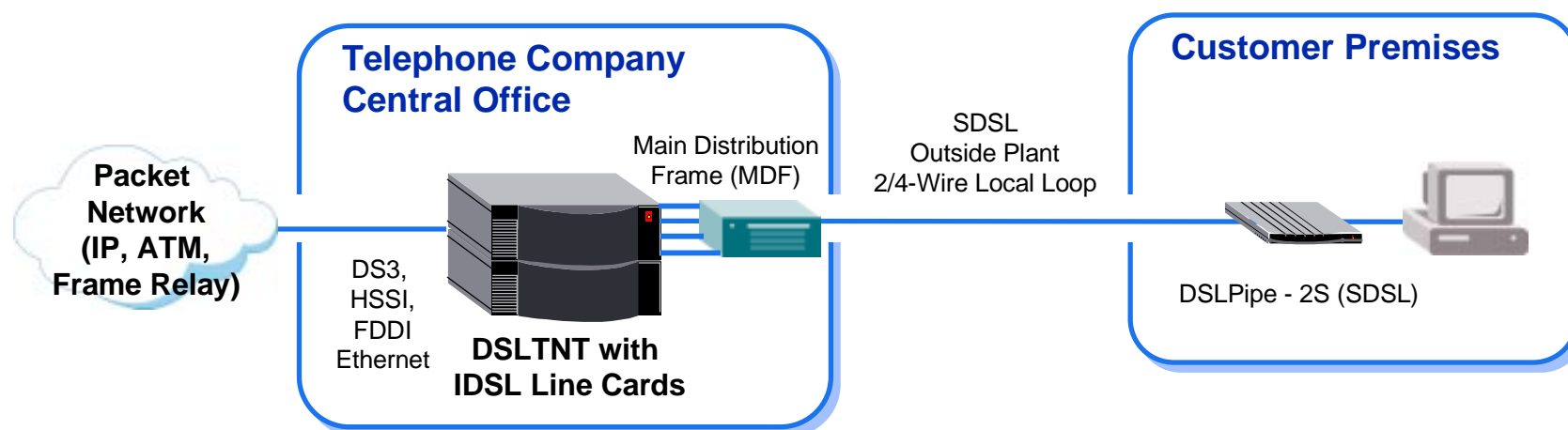
ISDN Vs IDSL

- **ISDN**
 - Uses CO switch for data calls
 - Port contention and delays
 - 2 B-channels not always available
 - Can be expensive for small businesses (e.g. with 0.02/minute/B-channel usage charge, monthly charge can be as high as \$1800)
 - Contributes to voice network congestion
- **IDSL**
 - Does not use CO switch for data calls
 - No port contention and delays
 - Always-on 128 Kbps connection
 - Can be flat rate (\$75-\$150 per month); no usage charge; ideal for small businesses hosting Web servers
 - Alleviates voice network congestion



Technology Overview

Symmetric Digital Subscriber Line (SDSL)



- 1.54 Mbps, two pairs of wires, up to 12,000 ft
- 768 Kbps, one pair of wires, up to 12,000 ft
- Line monitoring and diagnostics
- CPE provides Ethernet interface
- 2B1Q line coding



Technology Overview

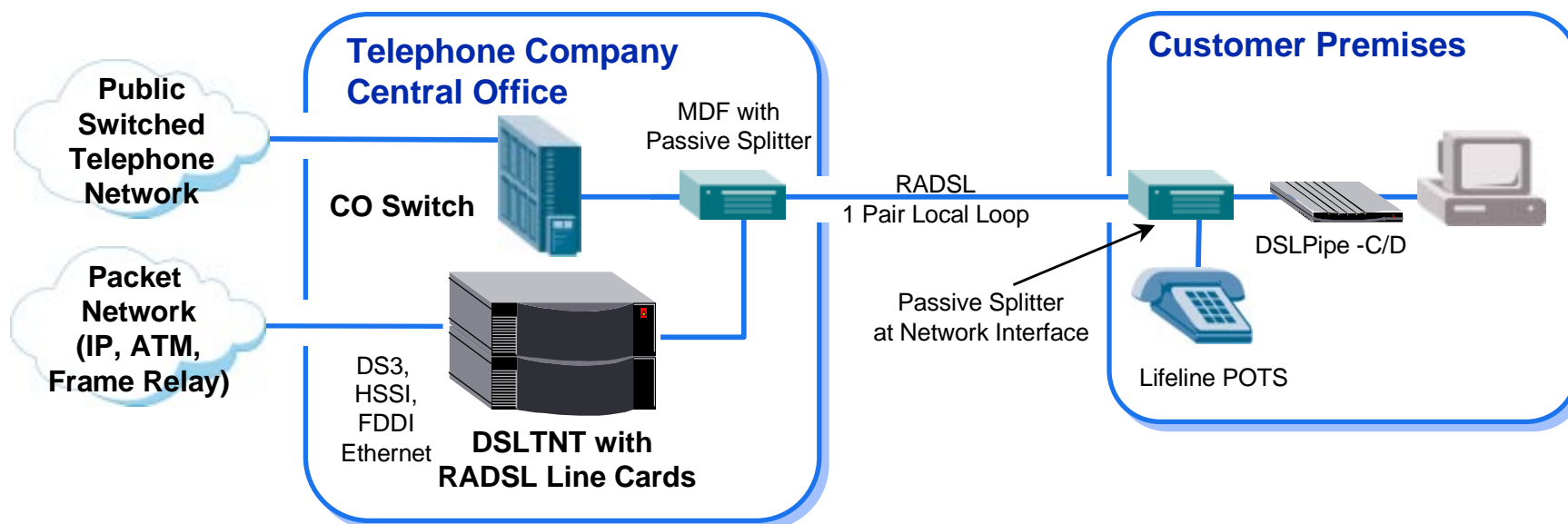
Why SDSL ?

- **Can Co-Exist with T1 on the same binder group**
 - SDSL works well with T1 in the same binder group
 - Higher reliability
- **Need for higher speed in both directions**
 - 768 Kbps/1.54 Mbps in both directions with SDSL
 - ADSL can go down to as slow as 272 Kbps upstream and 640 Kbps downstream



Technology Overview

Asymmetric DSL (RADSL)



- **CAP - Single Pair, 17,000 ft. Loop**
 - 544 Kbps Upstream
 - 640 Kbps Downstream
- **CAP - Single Pair, 10,000/12,000 ft. Loop**
 - 1.0/1.0 Mbps Upstream
 - 7.0/2.5 Mbps Downstream
- **Lifeline POTS**
- **DMT - Single Pair, 18,000 ft. Loop**
 - 176 Kbps Upstream
 - 1.54 Mbps Downstream
- **DMT - Single Pair, 12,000 ft. Loop**
 - 640 Kbps Upstream
 - 6.14 Mbps Downstream
- **Lifeline POTS**



Market Challenges

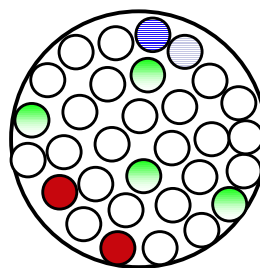
xDSL in the Same Binder

	IDSL	SDSL	T1	ADSL
IDSL	Yes	Yes	Yes	Yes
SDSL	Yes	Yes	Yes	Yes
T1	Yes	Yes	Yes	No
ADSL	Yes	Yes	No	Yes

 - T1

 - IDSL/ SDSL/ HDSL/ ISDN

 - ADSL

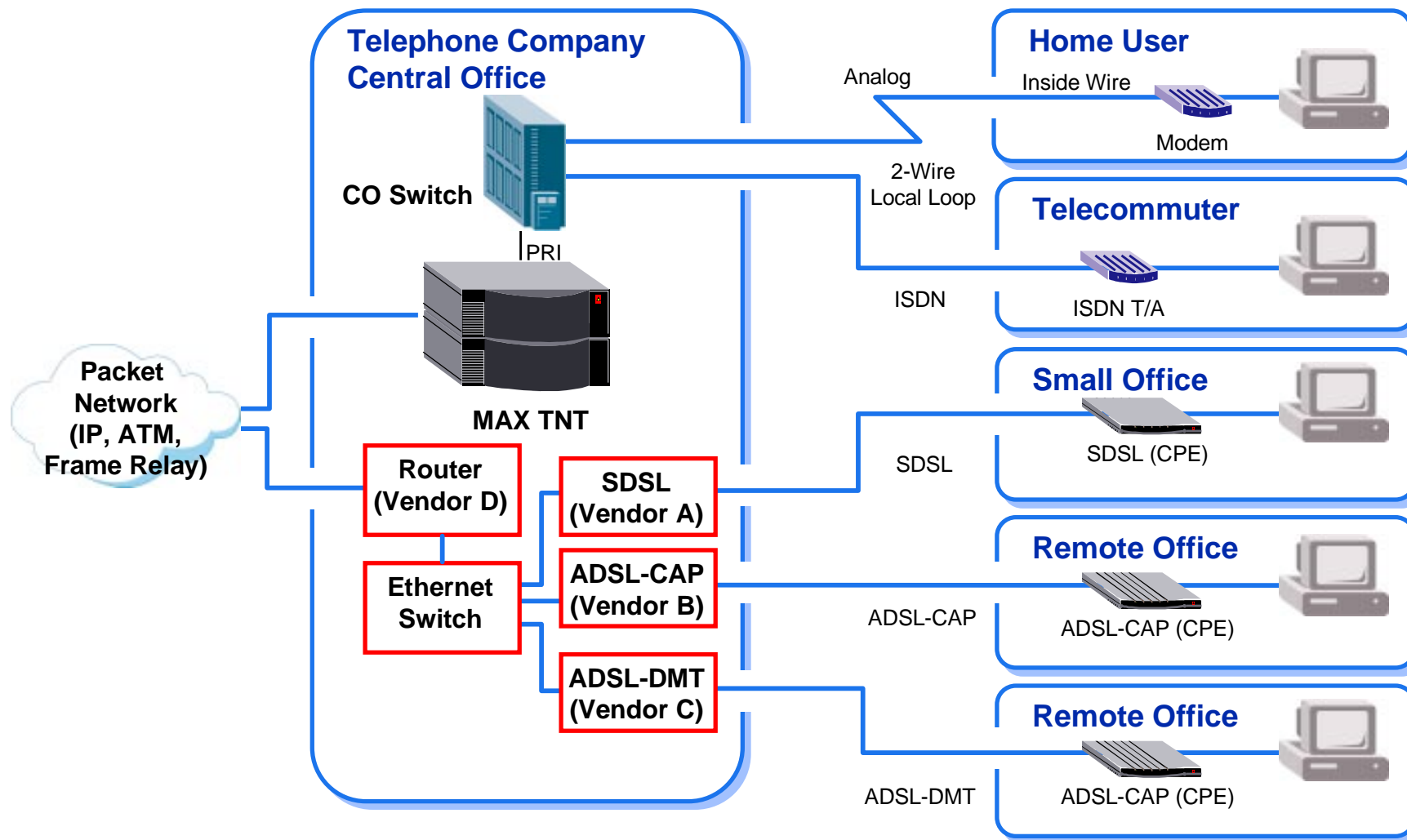


Binder Group



Market Challenges

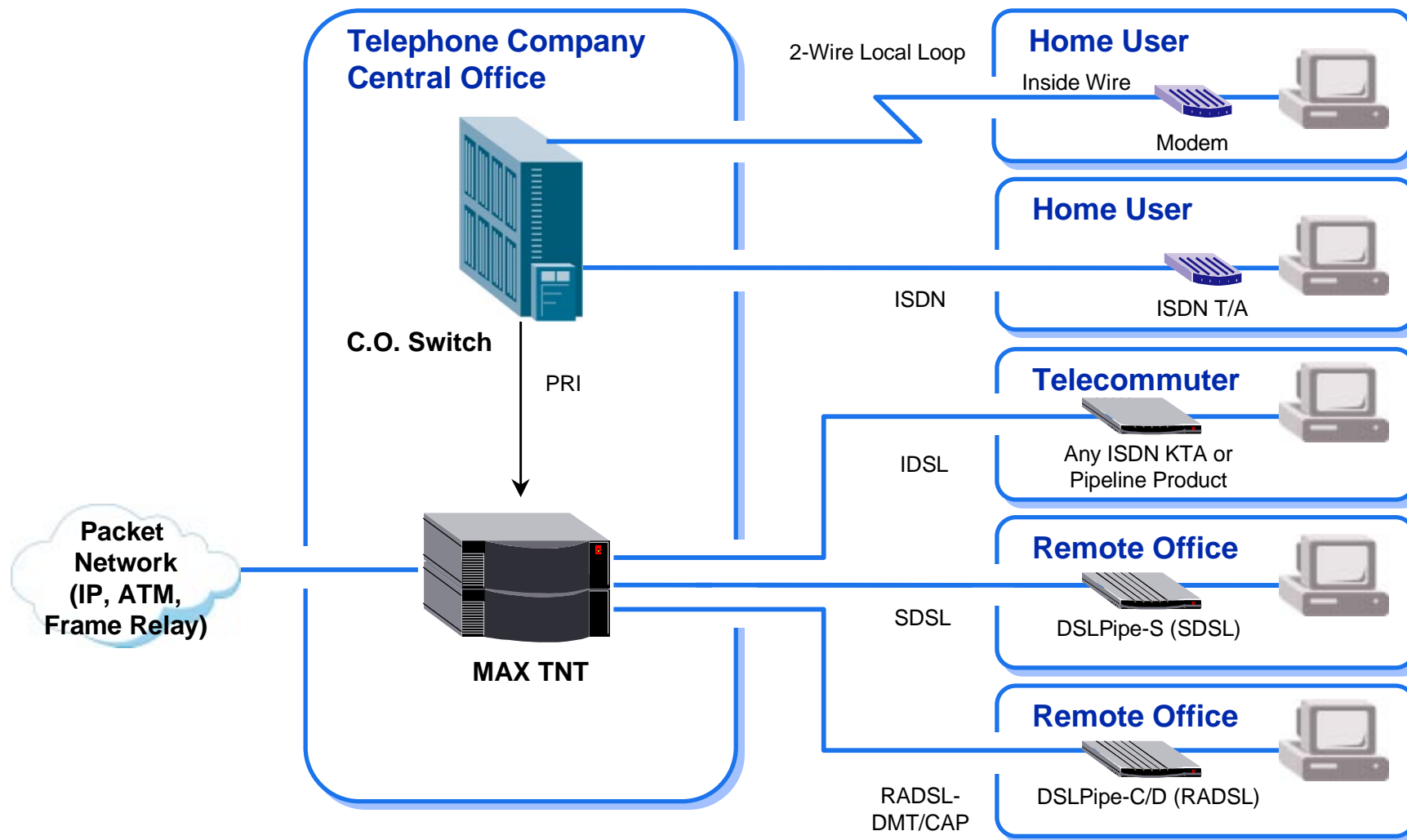
Without Ascend DSL solution





Market Challenges

With Ascend DSL solution





Product Overview

- **Central Office Equipment (COE)**

- DSLTNT™, MAX TNT™
 - RADSL-CAP
 - RADSL-DMT
 - SDSL
 - IDSL
- MAX™ 4000/4002/4004
 - IDSL

- **Customer Premises Equipment (CPE)**

- DSLPipe™ -C (RADSL-CAP)
- DSLPipe-D (RADSL-DMT)
- DSLPipe-S (SDSL)
- DSLPipe-2S (SDSL)
- Pipeline® (IDSL)
- Any ISDN TA (IDSL)



Product Overview

MultiDSL Cards	Ports per Card	Max # of Ports /Chassis	Availability
IDSL (MAX 400x)	8	40	Shipping
IDSL (DSL TNT & MAX TNT)	32	224	Shipping
SDSL (DSL TNT & MAX TNT)	16	240	Shipping
RADSL-CAP (DSL TNT & MAX TNT)	6	90	Shipping
RADSL-CAP (standalone)	1 port	1 per unit	Shipping
SDSL (standalone)	1 port	1 per unit	Shipping
RADSL-DMT (DSL TNT & MAX TNT)	TBD	TBD	Q4 1997



Product Overview

MultiDSL		Availability
Pipeline	IDSL	Shipping
DSLPipe-2S	SDSL	Shipping
DSLPipe-S	SDSL	Shipping
DSLPipe-C	RADSL-CAP	Shipping
DSLPipe-D	RADSL-DMT	Q4. 1997



Product Overview

Central Office Equipment

- **DSL TNT**
 - Fully integrated, multiservice, xDSL concentrator
 - 16-slots per 14" chassis
 - Redundant AC/DC power supply,
 - Hot-swappable line cards
 - Line Cards: RADSL-CAP, RADSL-DMT, SDSL, IDSL
 - Network Interface Cards: T1/PRI, E1/PRI, FrameLine™, 10Base-T, 100Base-T, HSSI, DS-3, SWAN
 - Line cards & network interface cards are interchangeable between DSL TNT and MAX TNT —protects customer investment
 - Fits seamlessly into existing authentication and accounting infrastructure
 - Transport protocols: Frame Relay concentration, PPP, MP, MP+



Product Overview

Central Office Equipment

- **DSL TNT (Continued)**
 - List Price:
 - \$8,900
 - Base chassis, one power supply (AC/DC), one controller card, support for RADSL line cards, network interface cards and Frame Relay
 - \$4,000
 - SDSL hash code; Adds support for SDSL line card and ISDN signaling
 - \$4,000
 - IDSL hash code; Adds support for IDSL line card and ISDN signaling
 - Price for network interface cards for DSL TNT are same as for MAX TNT



Product Overview

Central Office Equipment

- **RADSL-CAP**
 - DSLTNT, MAX TNT
 - 6-port per line card
 - Up to 15 cards per DSLTNT chassis (Up to 90 ports)
 - Frame Relay and PPP
 - Authentication
 - Speeds (downstream/upstream)
 - 7.0 Mbps/1.0 Mbps, single pair, up to 10,000 feet
 - 2.56 Mbps/1.0 Mbps, single pair, up to 12,000 feet
 - 640 Kbps/544 Kbps, single pair, up to 17,000 feet
 - Lifeline POTS with Splitters
 - List Price: \$4,995



Product Overview

Central Office Equipment

- **SDSL**
 - DSLTNT, MAX TNT
 - 16-port per line card
 - Up to 15 cards per DSLTNT chassis (Up to 240 ports)
 - Frame Relay, PPP, MP, MP+
 - Authentication
 - Speeds
 - 1.54 Mbps, two pairs, up to 12,000 feet
 - 768 Kbps, single pair, up to 12,000 feet
 - List Price: \$8,500



Product Overview

Central Office Equipment

- **IDSL**
 - DSLTNT, MAX TNT
 - 32-port per line card (dual slot)
 - Up to 7 cards per DSLTNT chassis (Up to 224 ports)
 - Frame Relay, PPP MP, MP+
 - Transparent to Digital Loop Carriers (DLCs) and “U” loop repeaters
 - Authentication
 - Speeds
 - 128 Kbps, single pair, 18,000 feet
 - Up to two Voice channels per IDSL circuit (Q4 1997)
 - List Price: \$8,900



Product Overview

Central Office Equipment

- **IDSL**
 - MAX 4000/4002/4004
 - 8-port per line card
 - Up to 5 cards per DSLTNT chassis (Up to 40 ports)
 - Frame Relay, PPP MP, MP+
 - Transparent to Digital Loop Carriers (DLCs) and “U” loop repeaters
 - Authentication
 - Speeds
 - 128 Kbps, single pair, 18,000 feet
 - Up to two Voice channels per IDSL circuit
 - List Price: \$3,000



Product Overview

Customer Premises Equipment

- **RADSL-CAP**
 - DSLPipe-C
 - One RADSL-CAP port, one Ethernet port and one console port
 - Frame Relay, PPP
 - Speeds (downstream/upstream)
 - 7.0 Mbps/1.0 Mbps, single pair, up to 10,000 feet
 - 2.56 Mbps/1.0 Mbps, single pair, up to 12,000 feet
 - 640 Kbps/544 Kbps, single pair, up to 17,000 feet
 - Optional Secure Access Firewall
 - List Price: \$1,295



Product Overview

Customer Premises Equipment

- **SDSL**
 - DSLPipe-2S
 - Two SDSL ports, one Ethernet port and one console port
 - Frame Relay, PPP, MP, MP+
 - 1.54 Mbps (two pairs), 768 Kbps (single pair)
 - Optional Secure Access Firewall
 - List Price: \$1,650
 - DSLPipe-S
 - One SDSL port, one Ethernet port and one console port
 - Frame Relay, PPP, MP, MP+
 - 768 Kbps (single pair)
 - Optional Secure Access Firewall
 - List Price: \$1,150



Product Overview

Customer Premises Equipment

- **IDSL**
 - Pipeline Products
 - One IDSL port, one Ethernet port and one console port (depends on model)
 - Frame Relay, PPP, MP, MP+
 - 2 voice channels (Pipeline 75/85)
 - Optional Secure Access Firewall
 - List Price: Depends on the model



Product Overview

- **Leverages advanced software functionality**
 - Bridging/Routing support for IP and IPX
 - Frame Relay PVC concentration
 - Ascend Secure Access™ Firewall
 - Authentication security such as Ascend Access Control, RADIUS, TACACS+, TACACS and Token cards
 - Accounting and billing features
 - Virtual Private Network Features
 - Frame Relay and IP Direct
 - Point-to-Point Tunneling Protocol (PPTP) and L2TP
 - Ascend Tunnel Management Protocol (ATMP)
- **Network management system**
 - Ascend network management system
 - Comprehensive SNMP MIB II implementation



Application

Intra-Building

- **Businesses in high rise buildings**
- **Residences in apartment complexes**



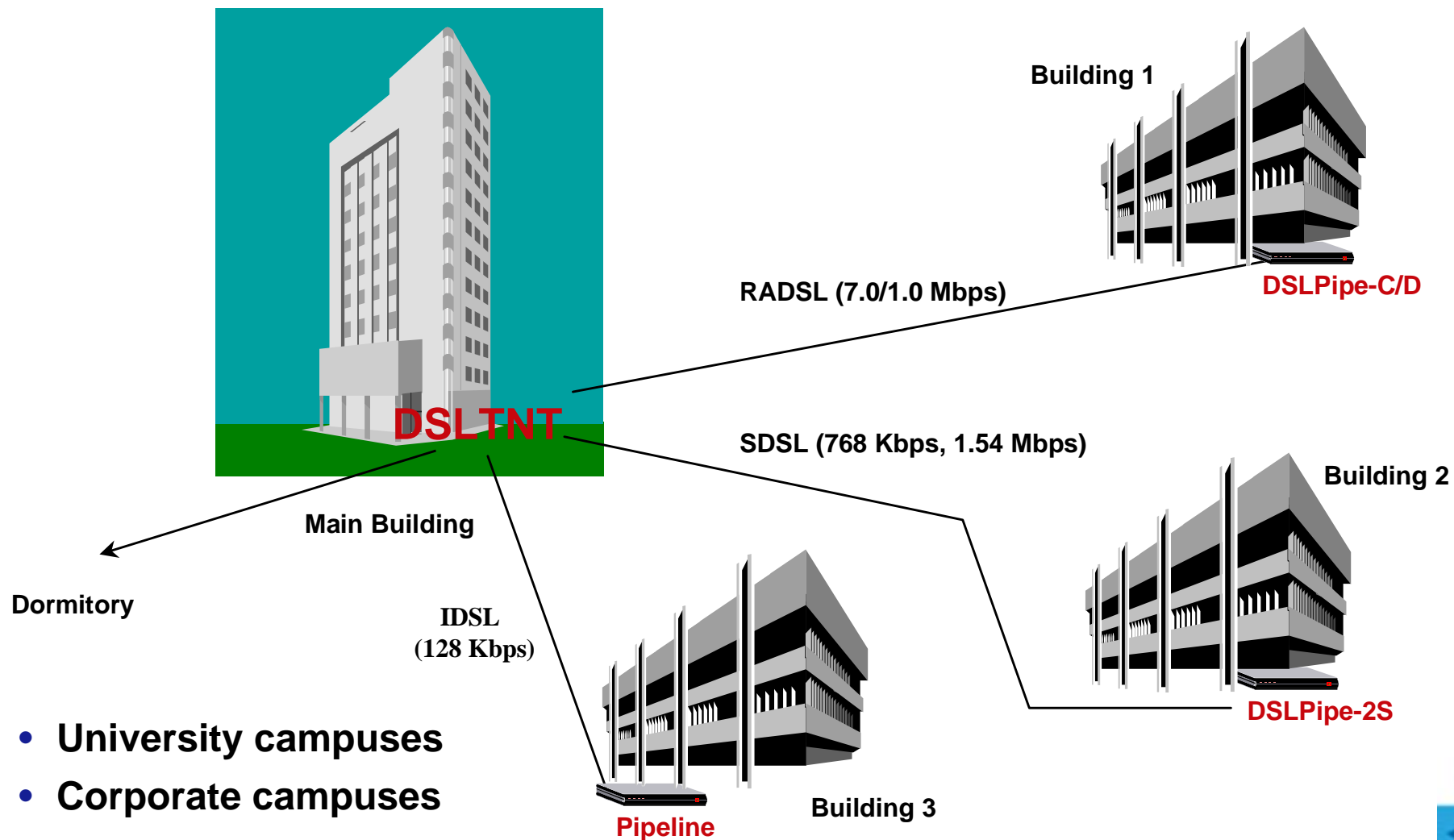
Internet/
Frame Relay

T1/Frame Relay 1.54 Mbps





Application Campus



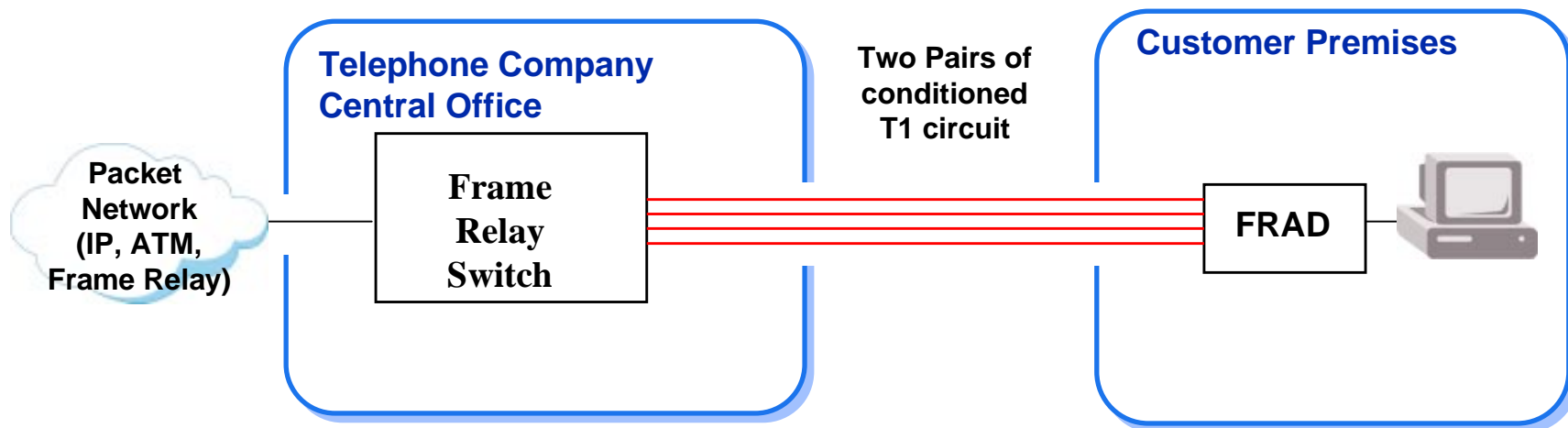
- University campuses
- Corporate campuses



Application

Frame Relay Services without MultiDSL

- Requires the most scarce resource: 4-wires
- Requires expensive conditioned T1 circuit
- Expensive circuit cost : Approx. \$290/Month to service providers

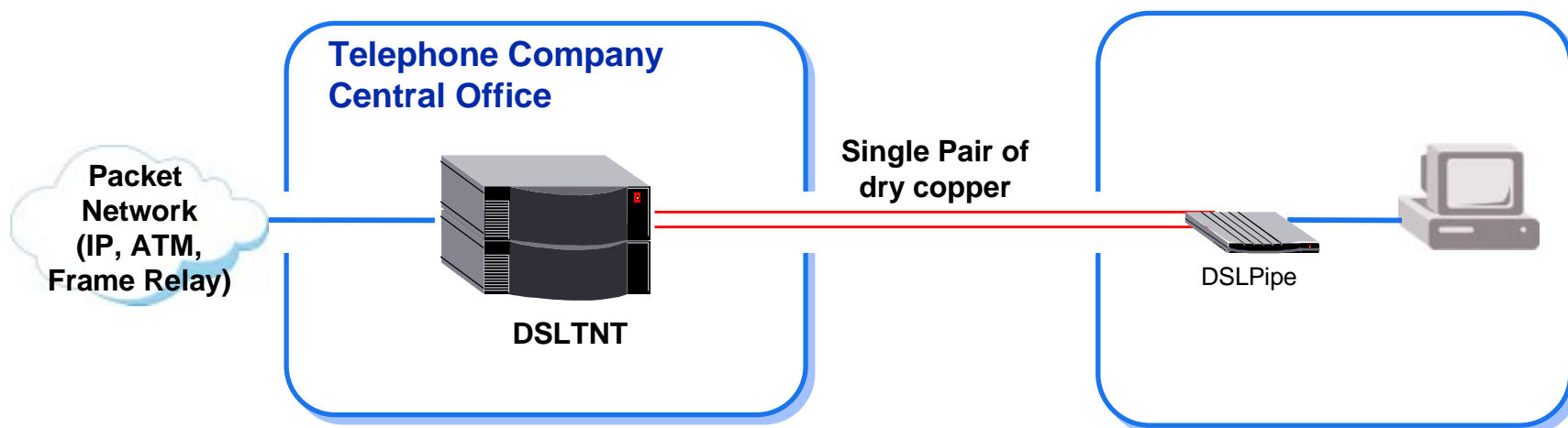




Application

Frame Relay Services with MultiDSL

- Single pair of dry copper; saves scarce resource - local loop
- Does not require expensive conditioning
- Lower circuit cost : Approx. \$12/Month to service providers
- High speed : 56K, 64K, 112K, 128K, 768K, 1.0 M, 2.5M, 7.0 M





Summary

- **Fully integrated, single multi-service platform DSLTNT ready to offer various services**
 - DSL services: IDSL, SDSL, RADSL-CAP, RADSL-DMT
 - Supports other traditional services
- **Seamlessly fits into existing authentication, billing and accounting infrastructure**
- **Routing/bridging capability**
- **Both COE and CPE for turn-key solution**
- **Router based DSLPipe (CPE) for data privacy**
- **Wide range of Egress : T1, Frame Relay, 100Base-T, 10Base-T, DS-3, SWAN, HSSI (1997), ATM (1998)**
- **Highest port density per 7-foot rack in the industry**
- **Protects end users' investment on ISDN CPE**